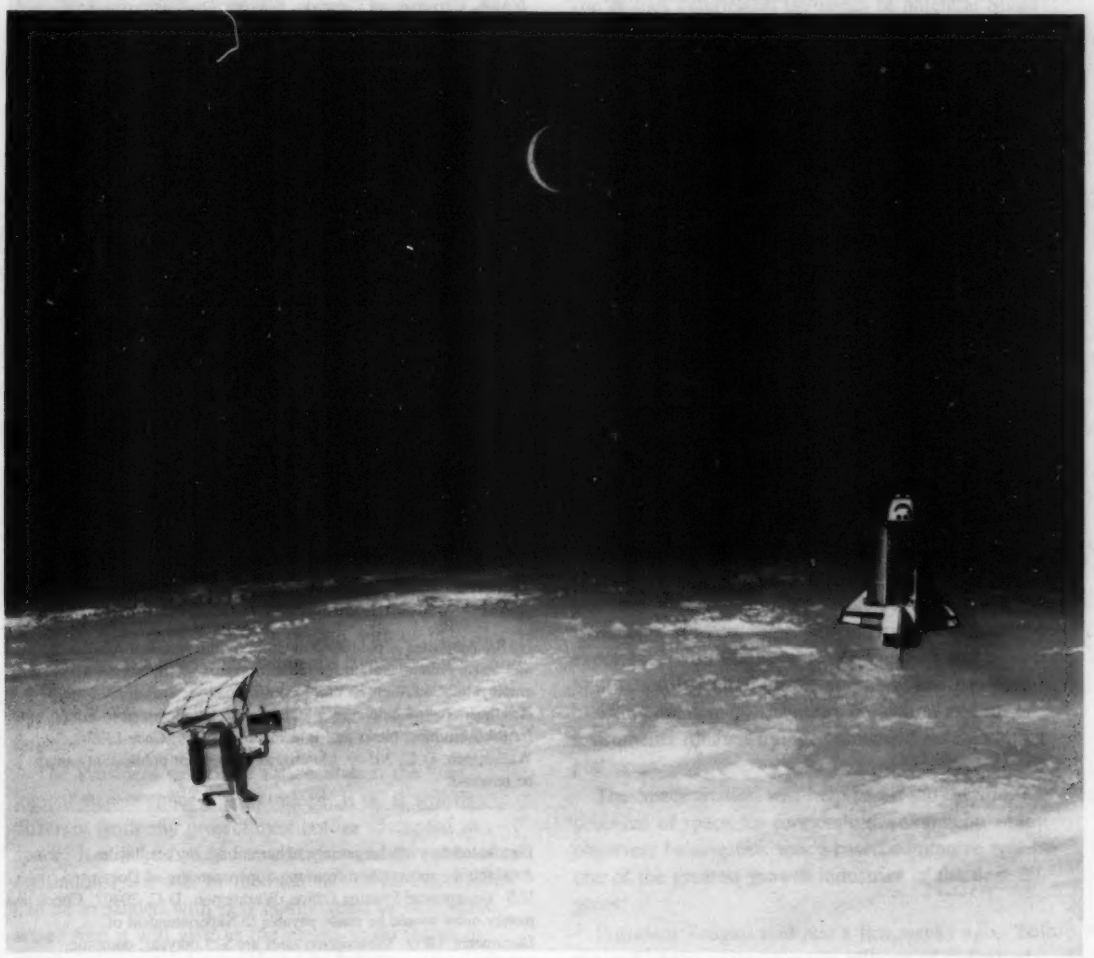
NAS1.46:16/6 DOCUMENTS

NASA Activities

National
Aeronautics and
Space
Administration

June 1985
Vol. 16, No. 6



JUL 31 1985

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

About the Cover

This oil painting entitled "Traveler on the Voyager" was done by artist Robert A.M. Stephens. The painting was inspired by Shuttle Mission 41-D.

Notice the astronaut in the manned maneuvering unit as he paints while he floats away from the shuttle, shielding his work from the Sun's rays with his canopy.

The NASA Art Program was established in 1962 at NASA Headquarters, Washington, D.C. with the goal of collecting unique documentation of America's advance into space. Nationally known artists are invited to visit NASA sites and record their perceptions in drawings and paintings which are then given to NASA.

Contents

Administrator's Column 3
Solar Energy Systems Power African Villages 5
Large Space Antenna Flexes Wings in Ground Test 6
NASA's Milton Silveira Named Engineer of the Year 7
Shuttle Student Program Resumed 7
Aeronautical Research Leader De France Dies 8
Heard From Around the World 9
The Godspeed Sails Again 9
NASA Broadcasts to Schools by Satellite 10
Langley Researcher Receives Floyd Thompson Fellowship 10
NSTL Approved as Location for Technology Transfer Center 11
NASA, University of Colorado, Boulder, Study Peruvian Area ... 11
Contractor News 12
Did You Know? 12
Payload Specialists Selected for SLS Flights 14
Scheduled Shuttle Launches for 1985 15
Another Dividend from Air and Space 16

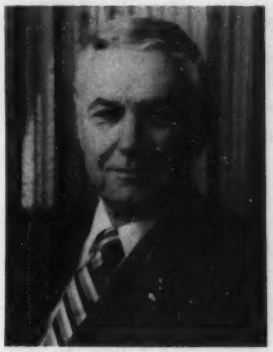
NASA Activities is published monthly by the National Aeronautics and Space Administration for the information of the agency's employees. Contributions and recommendations are solicited from Headquarters and field centers, and should be addressed to Editor, NASA Activities, News and Information Branch, Code LFD-2, Washington, D.C. 20546. Material submitted for publication cannot be returned.

Distributed free of charge only to current agency employees. Available by subscription from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Check or money order should be made payable to Superintendent of Documents, GPO. Subscription rates are $23.00/year, domestic; $28.75/year, foreign.

Dwayne C. Brown
Editor, Code LFD-2
NASA Headquarters
Washington, D.C. 20546
Phone: (202) 453-8400

Administrator's Column

(In this column NASA Activities features an article by NASA Administrator James M. Beggs. These articles focus on subjects chosen by him that address topics of broad interest to the agency's employees. The column this month features an address presented to Keidanren (Federation of Japanese Economic Organizations) in Tokyo, Japan.



Man's Permanent Presence in Space

On behalf of President Reagan and the Government of the United States, let me say that we are very pleased that Japan has agreed to work with us on parallel studies over the next 2 years as we define and begin to design the permanently manned Space Station. We look forward to working closely with them and our other friends and allies in Europe and Canada in a continuing partnership to develop, build and use the Space Station through the end of this century and well into the next.

It has been almost 16 months since President Reagan, in his annual State of the Union message to the American people, directed NASA to build a permanently manned Space Station and to do it within a decade. The President also invited our friends and allies in Japan, Europe and Canada to join with us in developing, operating and using the Space Station. And he proposed a new government-industry partnership to stimulate investment and involvement in space-based business.

The President called the Space Station the "next logical step in space." And indeed, it is. It will be different from any project ever before attempted in space. It will be manned at all times and be operated continuously. It will be modular so that its capabilities can be expanded with new components as new needs arise. And it will give us the means to do things in space we've never been able to do before.

When it is up and operating in the early to mid-1990s, the Space Station will be the catalyst for expanding the peaceful uses of space for scientific, industrial and commercial gain. The Station will serve as a laboratory for materials processing and industrial and scientific research; as a permanent observatory for astronomy and Earth observations; as a storage and supply depot and as a base from which to service other satellites or satellite clusters, which will form the world's first space-based industrial park.

There will be other uses for the Space Station, perhaps some that we have not yet thought of. But we now have a good idea of how we will want to use the station initially. These utilization concepts were developed by mission requirements studies done over the past 3 years by government and industry here in Japan, in the United States and in Europe and Canada. The studies determined the needs of potential Space Station users in the scientific, academic, industrial and commercial communities. They laid the groundwork that has allowed us to proceed together to the next phase of Space Station development—the definition and preliminary design phase.

The document we signed with Japan, and similar documents we signed earlier with our Canadian and European friends, set the framework for an international partnership over the next 2 years that will meet the requirements of all nations involved. They assure that our partners' efforts and ours will run parallel and that we will cooperate closely to evolve a Space Station design that will serve all our interests for the long-term.

Potential international contributions to the Space Station could prove extremely valuable in expanding its capabilities. For example, we are very pleased that Japan is studying a multi-purpose experiment module that could contain both pressurized and unpressurized work space.

The European Space Agency has been looking at the development of pressurized modules, unmanned space platforms and ground support facilities. And the Canadians are very interested in expanding their experience with the Remote Manipulator System—the Shuttle's robot arm—in the servicing and payload handling area, in solar energy collection and in instruments for free-flying, unmanned polar-orbiting platforms.

The Space Station will help us all tap the limitless potential of space for economic development. Many observers believe that space-based commerce will be one of the greatest growth industries of the next 20 years.

President Reagan said just a few weeks ago, "before the end of the century, many billions of dollars of commercial activity will be taking place in and because of space." Some members of the United States Congress believe that activity could generate a half-a-trillion-dollar industry worldwide by the turn of the century, and one that will provide 20,000 new jobs.

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

The communications satellite business is certainly the most visible example of a successful space enterprise thus far. It has grown into a $3 billion a year business, and is projected to expand at a rate of 20 percent a year through the turn of the century.

Remote sensing, advanced electronics, robotics, ground servicing facilities and other space-related activities all will benefit as we continue to push back the economic frontier of space.

Space has many unique characteristics. Among them are microgravity, which produces a weightless condition; an infinite, pure vacuum; and a remarkable vantage point for observing the Earth and the Universe.

Many companies are investigating the commercial potential of these features. And, in the process, they are doing some very exciting things.

Johnson & Johnson and McDonnell Douglas, for example, are finding that a laboratory technique known as electrophoresis, works much better in space than on Earth. The process separates materials from a biological mass by means of an electrical charge. They have adapted the technique for space operations and are using it on the Shuttle to test-manufacture a hormone with the potential to save thousands of people's lives every year. They expect to produce it on orbit and in much greater quantity and in greater purity than is possible on Earth.

The John Deere Company, an agricultural implements manufacturing firm, is experimenting with developing new alloys in space with the hope of learning how to duplicate them on Earth.

And the giant 3M Company is developing organic crystals and very thin industrial films in space. They are very enthusiastic about results so far and have proposed a 10-year plan during which NASA would fly 72 of their experiments. They also want to build a research laboratory as part of the Space Station. Chances are that NASA will approve their plan. And if we do, it will mark our first commitment to a long-term cooperative venture involving space-based research, development and manufacturing.

A crystal growth experiment aboard Spacelab.

Very soon, the first products made in space will go on sale. They are incredibly tiny, perfect polystyrene spheres — about 10 micrometers in diameter. They will be marketed to calibrate scientific instruments and as a tool to measure very small objects. Their market potential has been estimated at between $200 and $300 million a year.

Much of the enthusiasm for space-based ventures in the United States has been generated over the past 2 years by President Reagan's policies. The President's vigorous support of expanded private sector investment and involvement in space has given the business and financial community the confidence to go ahead.

Investors understand that the rewards may be slow in coming. Investments generally will not pay off before 15 or 20 years. But they also believe that the bounty can be worth waiting for. Indeed, in Shakespeare's words, it can be "as boundless as the sea."

Our international partners on the Space Station will share in that bounty. Over time, the benefits they will reap will far outweigh the costs of their investments.

Although the United States is committed to building the Space Station alone, if necessary, we are delighted that our international partners are moving with us into this initial phase. And we look forward to continued joint cooperation with Japan and our other friends as the program moves ahead.

In that connection, let me say that in negotiating with our potential partners, NASA has emphasized that we view the Space Station as a potential long-term international partnership — one that should last for decades. Any nation that joins with us in such a full partnership must be prepared to make significant investments in the Station, and also be prepared to help operate and use it.

We expect our partners to continue to shoulder responsibility for owning and maintaining their portions of the facility, while continuing to enjoy the overall benefits our joint efforts will make possible. And we expect their contributions to remain a permanent part of the Station's infrastructure.

But, as the ancient Greek dramatist Euripides once wrote, "Joint undertakings stand a better chance when they benefit both sides."

To cement our long-term relationships, the United States will provide partners with assurance on equitable access to all of the Space Station's facilities. We also will protect their technology and intellectual property and ensure them suitable roles in the Station's management and operation.

The Space Station effort will span decades because the Station will grow in capacity and capabilities as new technologies emerge and new needs arise. It will be the

largest and most difficult engineering challenge of the Space Age. Full partnership with international participants will mean that we will be negotiating further agreements on subjects ranging from housekeeping arrangements and crew and laboratory time to customer charges and the use of launch facilities.

Clearly, there will be much give and take on all sides in future negotiations. But if we and our international partners can learn to work together on a project of this scope, I am confident that we will have built a framework for other, more ambitious joint endeavors in the future.

Indeed, such missions as the development of a manned lunar base or a manned mission to Mars could well follow the Space Station. Missions of this kind could have universal appeal and would inevitably bring the world's people closer together. Thus they would enhance the prospects for peace on earth and in space.

An artist's concept of a 21st century lunar base.

The great adventure we call space exploration has been going on for only a little more than a quarter of a century, merely a whisper in time. But in that period, we have advanced our knowledge of ourselves and our place in the Universe further than in any period in history.

Today we go into space routinely with the Shuttle. We are learning to live and work there. But this is only a beginning.

The future holds great promise. Given human ingenuity, human imagination and the age-old human quest for new knowledge, our achievements could surpass even our wildest dreams today. As President Reagan has said: "There are no constraints on the human mind, no walls around the human spirit, no barriers to our progress except those we ourselves erect."

Indeed, there is no limit to what free people can achieve because freedom is humanity's most precious resource. It allows us to think, to explore, to dream and to transform our dreams into reality.

Americans and free people everywhere would have it no other way. And this is why we will continue to grow and prosper.

Solar Energy Systems Power African Villages

Some 3,000 residents in the Republic of Gabon, Africa, are beginning to benefit from space age technology. Solar-powered community service systems have been installed in four rural villages to improve public health and educational facilities, lighting and sanitary water supplies.

The purpose is to demonstrate the feasibility of using solar photovoltaic power systems as an energy source in a remote, rural, tropical environment and to determine the impact of these systems on the social and economic development in the villages.

NASA's Lewis Research Center, Cleveland, is managing the project, jointly funded by the U.S. Department of Energy (DOE) and the Ministry of Energy and Hydraulic Resources of the Republic of Gabon.

The Government of Gabon selected the villages of Onguia-Bougandji, Nyali, Donguila and Bolossoville for the demonstration.

A photovoltaic power system, lights, air circulation fan, and a refrigerator/freezer for vaccine storage have been provided for each village dispensary. A photovoltaic power system, lights, and a color television and video cassette recorder/player have been provided for each village school except Bolossoville, where the system has been located in the community building.

The sanitary water system has a newly-drilled well, a solar photovoltaic system, a submersible well pump, a water storage tank, and a water distribution system which pipes water to village fountains. The public lighting system includes a photovoltaic power system and a low pressure sodium vapor lamp mounted on a pole. All four systems are instrumented and data are being recorded daily for performance analyses.

According to Tony Ratajczak, project manager for Lewis, the goal of DOE and the Republic of Gabon for this project is to investigate and evaluate the economic, social and technical value of photovoltaic power systems in aiding progress and improving the quality of life in Gabon.

Because of very low population density and very poor roads in most villages, the Gabonese government is

investigating the use of renewable energy systems for its unelectrified areas.

Total photovoltaic array capacity for all systems is 12.1 kilowatts. Output of the smallest photovoltaic array is 80 watts for the street lights, and the largest output is 3 kilowatts for one water pump.

Batteries for the solar arrays are expected to last about 10 years before replacement is required. The solar arrays have a life expectancy of at least 20 years.

NASA and DOE will provide operational support for a 1-year period through Solavolt International, Phoenix, and their Gabon subcontractor.

Lewis has worked closely with the Department of Energy and the Agency for International Development for the past 10 years to advance the use of photovoltaic power systems for remote-area terrestrial needs in this country and abroad. Since 1979, Lewis has been responsible for the installation of 58 photovoltaic power systems in 27 countries.

Large Space Antenna Flexes Wings In Ground Test

The first successful ground deployment of a 50-foot diameter antenna system marks a milestone in NASA's program to demonstrate that large space antenna concepts are feasible.

The tremendous size of potential large space antennas means a significant boost in effective radiated power from space and an increased sensitivity to weak signals from the ground or from other points in space.

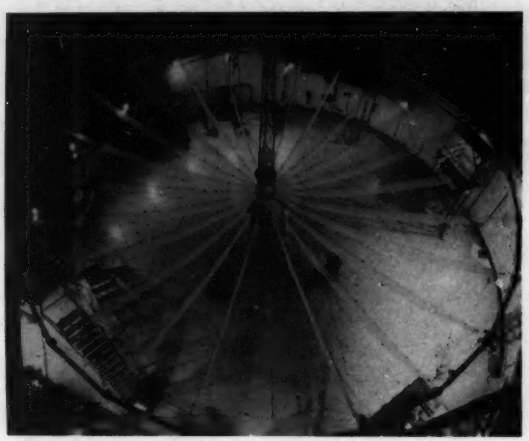
One potential application is in communications. Presently, a large antenna must be placed at each Earth station to receive the weak signals transmitted through small antennas on satellites. By placing large antennas in space, the size and cost of the antennas required at each ground site will be greatly reduced. A few super-antennas placed in high geosynchronous orbit could cover the globe, instead of the great number of smaller satellites that otherwise would be required.

Additionally, millions of inexpensive home rooftop or land mobile unit antennas could receive satellite signals now picked up by only a few very large ground stations.

The ultimate deployable space antenna may have diameters as large as 150 to 300 feet or as long as a football field. Studies show that larger concepts will have to be assembled in space.

Even at 50 feet, points out Dr. Earle K. Huckins, former head of Langley's Large Space Antenna Systems Technology Office, the test antenna represents a quantum jump in performance compared to the largest space antennas used today for civil applications. The experimental Applications Technology Satellite (ATS-6), launched by NASA in 1974, used a 30-foot antenna to relay TV and other signals to a variety of receivers in previously isolated areas around the globe. A more precise antenna surface and a modest increase in size makes the test antenna many times more powerful and a candidate for use on the Space Station.

NASA research in a broad range of disciplines — including materials, packaging and control of large flexible structures — has advanced the technology required for development of large space antennas and, says Huckins, has significantly reduced the economic risks for industrial application.



Large space antennas could be the next step in global communications.

The test, recently conducted for NASA by the Harris Corp., Melbourne, Fla., demonstrated that the hoop-column antenna concept will unfold — umbrella-style — from a compact package to a graceful combination of thin structural members, quartz filament cords and gold-plated mesh.

The mesh serves as a precision reflecting surface stretching across the diameter of the supporting "hoop." The mesh surface is shaped like a dish, but could be designed to be flat, spherical or conical, depending on the intended application. The antenna column is an equally precise, telescoping hub, forming the central structure of the antenna, tensing the cords that shape the antenna surface and housing the electronic feed mechanism.

NASA believes the 50-foot antenna system is the largest precision antenna designed for space that can be accommodated in existing ground electromagnetic test facilities. A series of additional tests are planned using

this system as a benchmark.

Thomas G. Campbell, a researcher at NASA's Langley Research Center, Hampton, Va., puts the test into perspective: "Now we've proven that the hoop-column concept will mechanically deploy from a small, Shuttle-compatible package into a strong but lightweight structure providing a large precision reflector surface. It looks good. The next phase of the test program is aimed at confirming the radio frequency preformance of the system. For that, we've gone to Martin Marietta Corp., Denver."

NASA's Milton Silveira Named Engineer of the Year

NASA Headquarters Chief Engineer Dr. Milton Silveira has been named the NASA Engineer of the Year. Silveira was one of 36 agency winners competing for the title of Federal Engineer of the Year.

The National Society of Professional Engineers (NPSE) sponsors the Federal Engineer of the Year Awards (FEYA) program in conjunction with National Engineers Week. Silveira received his award in Washington, D.C. during the sixth annual FEYA banquet.

As Chief Engineer and later Deputy Program Manager for the Space Shuttle Orbiter, Silveira was the principal engineer responsible for the development of many advanced technology systems. He was assigned to NASA Headquarters after the initial Space Shuttle flights and now investigates and makes recommendations to the Administrator when a major technical problem develops. An example is the studies he initiated to the very successful Solar Maximum Spacecraft Repair Mission.

Holder of two NASA medals and dozens of Outstanding Performance, Sustained Superior Performance, Special, Cash, Group Achievement and Special Achievement Awards, Silveira received an honorary Doctor of Science degree from the University of Vermont, where earlier, he had earned a B.S. degree in Mechanical Engineering. He earned an M.S. in Aeronautical Engineering from the University of Virginia. Silveira is an Associate Fellow of the American Institute of Aeronautics and Astronautics.

Shuttle Student Program Resumed

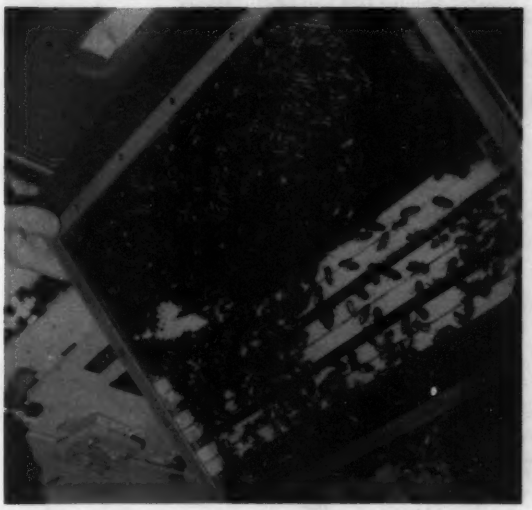
NASA and the National Science Teachers Association have announced the continuation of the Space Shuttle Student Involvement Program (SSIP) for its 6th year. The program provides an opportunity for secondary school students (grades 9-12) to write proposals for space science experiments.

The purpose of SSIP is to develop youth's awareness of space as a resource for experimentation and to stimulate interest in science and technology.

In next year's competition, up to five students from each of eight geographic regions will be selected as regional semi-finalists. These semi-finalists, along with their teachers, will be awarded an all-expense-paid trip to a Space Shuttle Symposium at a NASA center. A highlight of the regional symposia will be the opportunity for the students to interact with NASA scientists and engineers.

One semi-finalist from each region will be selected as a national winner and will attend a national Space Shuttle Symposium at the Kennedy Space Center. The three students submitting the most outstanding proposals will be awarded scholarships by the National Science Teachers Association at the symposium.

During the upcoming school year, in addition to the competition, a special committee made up of scientists, engineers and educators will be formed to redesign the SSIP format to better serve science education.



In one student experiment bees were observed to see if a colony could function in a zero-g environment as efficiently as on earth.

Aeronautical Research Leader De France Dies

Dr. Smith J. De France, first director of NASA's Ames Research Center and long the country's leading designer of large wind tunnels for aeronautical research, died in May at his Los Altos home. He was 89.

Born in Battle Creek, Mich., De France interrupted studies at the University of Michigan to fly Spads for the Army Signal Corps in World War I and win a Silver Star. Upon graduation in 1922 with a B.S. degree in aeronautical engineering, he joined the National Advisory Committee for Aeronautics (NACA), predecessor agency to NASA, at the Langley Aeronautical Laboratory (now Langley Research Center). This began a 43-year career with NACA and NASA, where he became an international authority in wind tunnel design, construction and operation.

At Langley, he designed the 30-by-60-foot wind tunnel, the largest ever built at that time. In 1939, he was chosen to plan and supervise construction of the country's second aeronautical research facility, the Ames Research Center. De France was named director of Ames in 1940. He presided over design and construction of the 40-by-80-foot tunnel at Ames, currently the world's largest wind tunnel.

Both the Langley and Ames big tunnels were used in many of the important advances in aeronautics during the 1930s, '40s and '50s because they could closely simulate actual flight of real airplanes.

At Ames, some 19 major wind tunnels were built under his leadership, spanning aircraft speed ranges from a few hundred miles per hour to several times the speed of sound. Eventually, in the late 1950s and early '60s, Ames tunnels solved various problems of rocket flight, perhaps most noteworthy, how to bring a spacecraft back into the Earth's atmosphere from orbit without burning it up. Under De France, in the early 1960s, spacecraft models flew at speeds up to 25,000 mph (Earth escape speed) and the first flight of the Apollo command module configuration took place in an Ames hypervelocity tunnel.

De France retired as director of Ames in 1965, at age 69.

His first work at Langley involved air flow problems with dirigibles. He carried out a variety of full-scale aircraft research programs in the big wind tunnels both at Langley and Ames. He was a proponent of flight research with full-scale models versus that with smaller scale test vehicles, because of the much greater reliability of the results.

While De France was director, Ames also became the NASA center responsible for basic research in the life sciences and broadened its research into a number of fields in space sciences.

De France received the Presidential Medal of Merit in 1947 for "outstanding success in designing and building the Ames Research Center, for organizing its staff into effective research teams, and for leadership in directing research programs in high-speed aerodynamics applied to the development of faster airplanes."

He received an honorary doctor of engineering degree from the University of Michigan in 1953 in recognition of his outstanding career in aeronautical engineering.

In 1952, the University of California awarded him the honorary degree of doctor of laws.

He was an Honorary Fellow and vice president of the American Institute of Aeronautics and Astronautics, and a member of the American Association for the Advancement of Science, Sigma Xi, and Tau Beta Pi.

De France received the 1964 Career Service Award of the National Civil Service League, a non-government organization dedicated to improving public administration.

He is survived by Jeanne Keel of Paynes Creek, Jim Padelt of Cupertino, JoAnne Thompson of Scotts Valley, Jane Hansen of Los Altos, and John Padelt of Ben Lomond, Calif.

Smith J. De France

Heard From Around the World

(Non-NASA News Sources)

Tokyo—The National Space Development Agency of Japan (NASDA) has announced that six men and a woman have passed the third selective examination for Japan's first astronaut to go aloft in a U.S. Space Shuttle in 1988. The seven candidates were chosen from an initial field of 533.

NASDA said that they will be sent to NASA in the United States this summer. After medical checks, three will be selected and trained as astronauts. One of those three will board the Space Shuttle in January 1988.

The tasks of Japan's first astronaut will be to conduct experiments on materials in the spacecraft's laboratory. The 34 experiments include making semiconductors and pharmaceuticals in the weightless state of space flight.

The six candidates are in their 30s and the seventh in the 20s. Three are public officials, one is a company employee, another is a graduate school student, and the only woman is an instructor at a private university.

Japan—The Ministry of International Trade and Industry (MITI) has disclosed a plan to develop an unmanned space laboratory beginning next year to promote the commercial use of outer space.

The unmanned laboratory, or free flier, which MITI plans to develop independently, will be launched into space by the U.S. Space Shuttle for automatic experimentation for an extended period. Its characteristics are said to be cheaper when compared with the Spacelab and other manned laboratories to be loaded on the Space Shuttle and will produce less vibration and pollution when compared with manned laboratories.

Since free fliers will be linked to a factory in the future, many countries are devoting their energies to their development. The European countries are scheduled to launch Eureka No. 1 in 1987 and the United States is to launch Leasecraft the following year. For the time being, Japan will be borrowing portions of the European and U.S. free fliers.

Japan also plans to experiment in alloying in 1988 by using one-third of the Spacelab. However, all these experiments will be for scientific purposes rather than for commercial use.

France—Through the French Space Agency and ESA, France has proposed a European manned, recoverable reentry space vehicle similar in design and mission to the U.S. Space Shuttle. If approved and funded by ESA, it would provide an autonomous European manned space program in conjunction with the Ariane 5 European payload launching system.

The proposed European shuttle would be somewhat smaller and carry less payload than the U.S. Shuttle. Called Hermes, the European design would be 15 to 18 meters in length, with a wingspan of 10 meters, a useful fuselage diameter of 3 meters, a cargo volume of 35 cubic meters, and a payload capacity up to 4500 kilograms. Hermes could carry a crew of up to 6 and could stay in space for up to 30 days.

If the program went forward this year, Hermes could be expected to achieve a first flight by 1992 with operational flights from the Ariane 5 as early as 1996. Two French companies, Aerospatiale and Marcel-Dassault, recently received pre-development study contracts for design analysis of this manned reentry vehicle.

The Godspeed Sails Again

On April 30, 14 men sailed from London aboard the "new" Godspeed. The voyage is a re-enactment of the December 1606 launch from England that led to the start of a new nation.

Prince Philip, husband of Queen Elizabeth II, and Virginia Governor Charles R. Robb presided at the departure from London's Isle of Dogs.

The replica, 68 feet long, was built by the Jamestown-Yorktown Foundation for over $500,000. The Newport News Shipyard completed the interior work at no charge. The "new" Godspeed, completed in the fall of 1984, was then moored at a Gloucester marina to begin sea trials.

Since the Godspeed has no engine, the trip from England to Jamestown is expected to take 10 weeks, including stops in the Canary and Virgin Islands and at Cape Henry.

"This is a voyage of contrasts," says Jim Rollings, Curator for Exhibits for NASA's Langley Visitor Center, "since sophisticated communication and navigation equipment will be used during the trip under some primitive conditions." For example, the ship has no sanitary facilities. The crew must also read and perform their duties and experiments using oil lamps for lighting.

The crew is using the Global Satellite Navigation System, NAVSTAR, on the open seas and the coastal navigation system on coastal waters. SARSAT is used to perform location accuracy experiments. The crew also uses voice and code communication equipment, including OSCAR, which is an amateur radio satellite.

Modern technology will make this voyage safer and more comfortable than the original one. The crew's diet

will consist of freeze dried and some cold foods kept in an ice box.

"The purpose of the voyage is to call attention to the fact that America's first permanent English settlement was in Jamestown, VA. — not Plymouth Rock, Massachusetts," says Rollings. To further enhance the recognition of the Jamestown settlement, the 14 selected crew members are all native Virginians. They are all civilians with sailing experience.

George C. Salley and Joe C. Gowdey are Langley's representatives on board. Salley, a recently retired computer science research manager at Langley, is the ship's captain. His chief responsibility is to safeguard the vessel and its crew, assuring that the voyage is carried out successfully.

Gowdey, head of the Electrical Systems Section at Langley where he is involved in the design and construction of spacecraft power systems, is the safety officer and engineer for the voyage.

History repeats itself with the voyage of the replica 17th century vessel Godspeed.

NASA Broadcasts to Schools by Satellite

Hundreds of junior high schools, colleges and universities in 40 states including Canada, Alaska, and Hawaii, through a project termed "Mission Watch", observed space science activities as they progressed aboard mission 51-D in April. More than 1500 schools participated in the pilot project and plans are in effect to continue the project on future missions.

The project is a cooperative effort with Satellite Communications for Learning Worldwide (SCOLA) and NASA, which televised live mission activities via satellite during the mission.

SCOLA is an association of schools, colleges and universities based at Creighton University in Omaha, Neb. It is one of the largest voluntary associations of institutional satellite antenna owners in the United States, representing all educational levels and academic interests.

Two days prior to launch, NASA scientists and engineers conducted a premission videoconference with the schools to acquaint the students and teachers with the planned mission and science experiments. Students from the schools also were able to ask questions to the briefers.

"Mission Watch" was introduced to the educational community primarily to test the technical and educational feasibility in educating our youth nation-wide. This may lead to developing interests in space careers and will certainly give our nation's future generation first-hand knowledge of NASA's science activities as they actually occur.

"Mission Watch" is scheduled to be used again during the 61-A and 51-L mission in October and January respectfully. The project is managed by NASA's Educational Affairs Division, NASA Headquarters, Washington, D.C.

Langley Researcher receives Floyd Thompson Fellowship

Dr. Roy C. Swanson, Jr., an aerospace technologist in the Theoretical Aerodynamics Branch, Transonic Aerodynamics Division at NASA's Langley Research Center, has been awarded the Floyd L. Thompson Fellowship for 1985-86 to study at Brown University in Providence, Rhode Island.

The fellowship allows researchers who have demonstrated continued growth in research to spend up to 12 months at an educational or research institution. It is named in memory of Dr. Floyd L. Thompson, Langley Director from 1960 to 1968.

At Brown, Swanson will conduct research on numerical schemes for the three-dimensional Navier-Stokes equations, under the direction of Professor David Gottlieb, an internationally-known mathematician. Gottlieb, who will be on leave of

absence from Tel Aviv University in Israel for the academic year, has conducted research in the principal features of the most widely used schemes (both explicit and implicit) for solving mixed hyperbolic-parabolic systems of partial differential equations, such as Navier-Stokes equations.

The principal objective of his research is to investigate the numerical properties of existing and proposed schemes for solving the time-dependent, 3-D Navier-Stokes equations. Both the numerical and computational efficiency of these schemes will be evaluated. Efforts will be made to construct more efficient algorithms for solving the Navier-Stokes equations for flow over aerodynamic configurations.

In previous work, Swanson has investigated and applied both explicit and implicit numerical methods to the Navier-Stokes equations, both full and thin layer.

Swanson, a Langley researcher since 1977, said there are potential benefits for NASA-Langley in many areas of aerodynamic research that would result from accelerating the development of a practical Navier-Stokes code for 3-D flows.

NSTL Approved As Location For Technology Transfer Center

Efforts to bring a $4 million Mississippi Technology Transfer Center to NASA's National Space Technology Laboratories (NSTL) were deemed successful when the state legislature approved and Gov. Bill Allain signed the $1.6 billion budget which included the bill to place the building at the installation.

NSTL Deputy Director Roy Estess said the action of the State of Mississippi is a bold, imaginative initiative which represents a true investment for the future of Mississippi and especially for young people who will have the opportunity to pursue high technology jobs in their home state.

He also stated that NSTL intends to support the program to the fullest extent possible to help achieve maximum success in this endeavor.

Of the opinion that NSTL is the most significant "technology" center in the state, Gov. Allain said that the state should take action to encourage its growth.

One focus of the 50,000-square-foot building will be to provide a means for transferring research conducted at NSTL to businesses in the public and private sectors.

The extra space in the high-tech building will allow room for growth among existing NSTL agencies and contractors, provide a location for new agencies and space for institutions of higher learning to use for research projects.

In support of NASA's space commercialization program, the building will also house a new center of excellence for remote sensing to be staffed and operated by the Mississippi Institute for Technology Development. And, the expansion of the Mississippi Technology Transfer Office to the new NSTL location would give state economic development staffers an opportunity to monitor research presently under way at the installation and to encourage Mississippi-based, spinoff industries to develop when the needs arise.

The proposed building will provide space for the creation of more than 250 high impact jobs, benefiting not only the local area, but also the entire state.

NASA, University of Colorado, Boulder, Study Peruvian Andes Area

Satellite imaging and remote sensing technology will be used to probe the tropical Andean jungles for archaelogical remains in Peru's Rio Abiseo National Park.

NASA's National Space Technology Laboratories (NSTL) in Mississippi, through its Earth Resources Laboratory, will collaborate in the project with the Anthropology Department of the University of Colorado at Boulder.

The archaeological interests in the park include the ancient site of Gran Patajen, the subtropical cloud forest and the park's diverse ecology. Data from the Landsat Earth Resources satellite will be combined with information gathered by a specially-equipped aircraft from NSTL.

Sophisticated instrumentation will allow researchers to "see" through the dense vegetation to locate evidence of past settlements in the now uninhabited region. Interesting geographical features and variation in vegetation may be observed and mapped as well.

"NASA's assistance will enable us to take a good look at the 1,060-square-mile park from above — immensely easier than trekking through the jungle on foot," said Thomas Lennon, co-director of the university's Rio Abiseo National Park Research Project.

"When cultural resources are identified through image analysis, we'll be able to check it out on the ground. This approach allows us to make the best use of the limited number of researchers, as well as the time we'll have in the field," Lennon added.

NASA's interest centers on expanding the applications of space technology. The fields of archaeology and anthropology represent areas which could benefit from advancements in remote sensing technology.

Thomas Sever, a NASA remote sensing specialist and archaeologist at NSTL, will provide support for the joint investigation for 1 year. His expertise will facilitate the research and transfer of specialized computer analysis techniques to the university.

The university, NASA and a remote sensing team at Peru's National Agrarian University in Lima, will collaborate on research and extracting information from various sensing devices. An early outcome of the project will be accurate, up-to-date maps of the uncharted parkland. The project is scheduled to begin in June.

The project is one of three archaeological research investigations being supported by NASA's remote sensing program, administered by NASA's Office of Space Science and Applications, Washington, D.C. Another project, involving the University of Colorado, is the examination of volcanic destruction of cities and vegetation in Costa Rica. The third project is supporting Richard Leaky, of the Leaky Foundation, who is searching for evidence of human evolution in Kenya, Africa.

Contractor News

NASA's Lewis Research Center has awarded a $11,145,000 contract to **United Technologies Corp., Pratt & Whitney Aircraft Group,** West Palm Beach, Florida for six RL-10 rocket engines to be used in support of the Shuttle/Centaur program.

The fixed-price-incentive contract is for the fabrication, assembly, test and delivery of the six engines with work being performed at the contractor's facility in Florida. Beginning in April, the contract will run through January 1987.

The Centaur high energy upper stage vehicle is being modified to fit into the Space Shuttle to launch various planetary missions for NASA and also to support Department of Defense missions.

Did You Know?

Seven world class gymnasts were tested recently at NASA's Johnson Space Center as part of a continuing study of the space adaptation syndrome.

The syndrome, or "space motion sickness" phenomenon, has affected about half the astronauts who have flown in space. Researchers wanted to know if gymnasts were less susceptible to the malaise because of their experience with moving and spinning in three dimensions.

The testing was co-sponsored by the United States Gymnastics Federation, of which the participants are members. Participating gymnasts were:

Kathy Johnson, 25, Huntington Beach, Calif.
Patty Gerard, 26, Watauga, Texas
Megan Marsden, 25, Cedar Falls, Iowa
Krista Canary, 22, Chicago, Ill.
Tom Beach, 30, Van Nuys, Calif.
Scott Johnson, 24, Colorado Springs, Colo.
Steve Elliott, 23, Lincoln, Neb.

The gymnasts underwent baseline testing at JSC in mid-April. The second battery of tests measured responses in laboratory settings and aboard a jet aircraft that induced brief periods of reduced gravity.

Gymnast performs a hand stand in a weightless environment.

The world's oldest astronaut has been reported to have been from China more than 5,000 years ago. The name of the man who wanted to reach the stars was Wan-Hu. According to Dr. Chgen Shouchun of the Chinese Ministry of Aviation, Wan-Hu tried to become a space traveler in the year 1500. The scientist Wan-Hu tied 47 large rockets (fireworks) to the backrest of a

chair, said farewell to his dear ones and had an assistant ignite the rockets. Regretfully Wan-Hu lost his life in the following explosion. His fame lives on however, for a lunar crater was named after him.

The Landsat satellites 4 & 5 have assisted in fighting fires that have raged in the Galapagos Islands located off the coast of Ecuador. The remote satellites relayed data to firefighters informing them where to dig trenches to prevent the spread of the blaze saving some of the world's rarest wildlife. The satellites infrared sensors pierced the dense smoke and pinpointed hidden hot spots. Due to improved software and increased familiarity with the Landsat system, scientists received data in 48 hours to help curtail the fires that had raged for 2 months.

The Space Shuttle has carried more than 390,000 lbs. of cargo into near-Earth orbit. Payloads have ranged from 260,000 postal covers to numerous scientific instruments and more than a dozen satellites. It would take a convoy of 10 tractor-trailers to carry as much cargo as the shuttle has in its first 15 flights, excluding military payloads.

The energy released by the three main engines of the Space Shuttle at full power levels is equivalent, in units of watts, to the output of 23 Hoover Dams. One main engine generates sufficient thrust to maintain the flight of two and one-half 747 airplanes.

Forty-four Langley Research Center inventors who received United States patents in 1984 and recipients of Langley's Technology Transfer awards were honored at the annual Inventors' Luncheon May 1. Langley Director Richard H. Petersen presented the awards and was the guest speaker for the occasion. Receiving awards were (front row from left) Ian O. MacConochie, E. Leon Morrisette, Bland A. Stein, Robert L. Fox, H. Douglas Garner, Jag J. Singh, Diane Stoakley, John R. Gleason (Army), Allan W. Frizzell, Margaret Hohl (receiving for Frank Hohl, deceased), Ja H. Lee; (middle row from left) Robert M. Baucom, Charles J. Camarda, Ashby G. Lawson, Thomas C. Moore, Allan J. Zuckerwar, Harold D. Burks, Bruce D. Little, Anne K. St. Clair, Donald J. Progar, Paul M. Hergenrother; (back row from left) John D. Buckley, Dick M. Royster, Gene J. Bingham (Army), Moses G. Farmer, Thomas T. Bales, Dwight G. McSmith, Terry L. St. Clair, Willard R. Weaver, Charles E. Byvik and James I. Richardson. Not shown: William T. Davis, Adolphus B. Blair Jr., Dennis M. Bushnell, Charlton W. Mann, Richard H. Couch, Robert R. Coultrip, L. Robert Jackson, Randall C. Davis, Lana M. Couch, David D. Kershner, David A. Yamaki, William E. Howell, H. Neale Kelly, Joseph S. Heyman, Darrel R. Tenney and Louis A. Teichman.

Payload Specialists Selected For Life Sciences Flights

NASA has selected two payload specialists for the initial Spacelab Life Sciences (SLS-1) flight and one of two payload specialists for the second flight (SLS-2).

The payload specialists for SLS-1 are Dr. F. Drew Gaffney, 37, an associate professor of medicine and cardiology and director of echocardiography at the University of Texas Health Science Center, Southwestern Medical School, Dallas, Tx. and Dr. Robert W. Phillips, 56, a veterinarian and professor of physiology and nutrition at Colorado State University, Ft. Collins, Co.

The payload specialist for SLS-2 is Dr. Millie Hughes-Fulford, 39, an associate professor of biochemistry at the University of California Medical Center, San Francisco, and a medical researcher at the Veterans Administration Medical Center in San Francisco. Hughes-Fulford is the first woman to be selected by NASA as a prime payload specialist for a Space Shuttle flight.

The selections were made by NASA Administrator James M. Beggs on the recommendation of Dr. Burton I. Edelson, Associate Administrator for Space Science and Applications, and the Investigators Working Group, comprised of principal investigators for the flights.

The two flights are the first fully dedicated life sciences missions to be flown aboard the Space Shuttle, which will provide a major effort in improving knowledge of living beings in the space environment. The missions will also contribute a significant step in preparing men and women for life aboard the Space Station.

A fourth payload specialist candidate, for the SLS-2 mission, will be selected shortly and will begin training with the three selected specialists in the near future.

Criteria for the selection included an advanced degree in life sciences or a medical degree and significant recent experience in laboratory research.

Nearly 50 candidates were nominated by the two flight's 23 principal investigators. The candidates underwent rigorous investigation by the group's Payload Specialist Selection Committee in late 1983. The final recommendations were made to NASA Headquarters in mid-April 1985.

SLS-1 is to be ready for launch aboard the Space Shuttle as early as spring 1986. SLS-2 is scheduled for an early 1987 launch.

The STS 61-D/SLS-1 mission will be commanded by veteran astronaut Vance Brand. Pilots will be David Griggs and Dr. John Fabian. The mission specialists will be Drs. Rhea Seddon and James Bagian.

The flight crew for the STS 71-G/SLS-2 mission is yet to be selected.

The two flights will conduct a variety of experiments in human and animal physiology and gravitational biology. Thirty major life sciences experiments will be conducted on the two flights.

The SLS-1 and SLS-2 missions are managed by Johnson Space Center, Houston, Texas, for NASA's Office of Science and Applications, Washington, D.C.

Expendable Launches

Date	Mission	Launch Vehicle	Launch Site*	Remarks
2nd Qtr.	AF-16	Scout	WFF	U.S. Air Force.
2nd Qtr.	Navy-22	Scout	WSMC	U.S. Navy.
2nd Qtr.	Navy-23	Scout	WSMC	U.S. Navy.
August	Intelsat VA-D	Atlas Centaur	WSMC	Intelsat communications.
August	NOAA-G	Atlas	WSMC	National Oceanic and Atmospheric Administration weather satellite.
3rd Qtr.	AF-17	Scout	WFF	U.S. Air Force.
October	GOES-G	Delta	ESMC	NOAA environmental satellite.
4th Qtr.	San Marco	Scout	SMR	NASA cooperative with Italy.

* **Launch Sites:** KSC — Kennedy Space Center, Fla.; ESMC — Eastern Space and Missile Center, Fla.; SMR — San Marco Range, Indian Ocean; WSMC — Western Space and Missile Center, Vandenberg Air Force Base, Calif.; WFF — Wallops Flight Facility, Wallops Island, Va.

Scheduled Shuttle Launches for 1985

Mission	Date/ Orbiter	Payloads	Crew
51-G	June 17, 1985 *Discovery*	Telestar 3-D Morelos-A Arabsat-1B Spartan-1 FEE/FPE	Brandenstein, CDR Creighton, PLT Lucid, MS Fabian, MS Nagel, MS Baudry, PS (France) Sultan Salman Al-Saud, Payload Specialist
51-F	July 12, 1985 *Challenger*	Spacelab 2	Fullerton, CDR Bridges, PLT Musgrave, MS England, MS Henize, MS Acton, PS (Lockheed) Bartoe, PS (USN civilian)
51-I	Aug. 10, 1985 *Discovery*	Syncom IV-4 ASC-1 MSL-2 Aussat-1 CFES	Engle, CDR Covey, PLT van Hoften, MS Lounge, MS W. Fisher, MS Jarvis, PS (Hughes) Walker, PS (McDonnell Douglas)
51-J	Sept. 26, 1985 *Atlantis*	DOD	Bobko, CDR Grabe, PLT Hilmers, MS Stewart, MS
61-A	Oct. 16, 1985 *Columbia*	Spacelab-D1	Hartsfield, CDR Nagel, PLT Buchli, MS Bluford, MS Dunbar, MS Furrer, PS (DFVLR) Messerschmid, PS (DFVLR) Ockels, PS (ESA)
61-B	Nov. 8, 1985 *Challenger*	Morelos-B Satcom KU-1 Aussat-2 EOS-1	Shaw, CDR O'Connor, PLT Cleave, MS Spring, MS Ross, MS Morelos PS McDonnell Douglas PS
61-C	Dec. 20, 1985 *Columbia*	MSL-3 HS-376 Satcom KU-2 EASE/ACCESS	Gibson, CDR Bolden, PLT Chang-Diaz, MS Hawley, MS Nelson, MS RCA PS

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans — and at a tiny percentage of the tax dollar. Here is an example:

Heart Rate Monitor

In the mid-1970s, NASA saw a need for a new type of sensing electrode for monitoring the heart action of astronauts over long periods of time. The widely-used conducting electrode, which makes contact with the skin through a paste electrolyte, is generally satisfactory for acquiring electrocardiographic data in normal use by hospitals or physicians, but for long duration use it had disadvantages—for example, the paste may dry, causing unacceptable distortions of the data sensed. Other electrodes make direct contact with the skin without use of a paste electrolyte. They, too, posed problems for long use in space, principally the "motion artifact," wherein movement of the subject causes movement of the electrode's contact and induces signal-distorting noise.

Accordingly, NASA initiated development—through a grant to Drs. Robert M. David and William M. Portnoy of Texas Technical University, Lubbock, Texas—of an advanced electrocardiographic electrode suitable for long term astronaut use. The Texas Tech team responded with an insulated capacitive electrode constructed of a thin dielectric film applied to a stainless steel surface. The electrode functions immediately on contact with the skin and is not affected by ambient conditions of heat, cold, or light, nor by perspiration, dry, rough or oily skin conditions; the insulative film prevents motion artifact.

NASA was assigned the patent to the invention and subsequently NASA awarded a license for use of the technology to California entrepreneur Richard D. Charnitski. Charnitski founded Heart Rate Inc. (HRI), Costa Mesa, California to continue development and to produce heart rate monitors and exercise machines for the physical fitness industry and medical markets. At lower right, a heart rate monitor is being assembled by a HRI technician.

HRI has completed prototype demonstrations for three products—a heart rate wrist watch, a chest strap mounted monitor and an aerobic machine controlled with heart rate. The sensors have also been tested and proven to meet the American Heart Association's specifications for electrocardiographic electrodes. HRI is discussing manufacture and marketing of these devices with other companies. One company is marketing the HRI device as the Aerobic Monitor for use by health clubs and sports organizations to assure that a user's heart rate during exercise is within proper limits; the user simply presses his thumbs to two sensors to get an instant digital heart rate reading. The unit can be wall-mounted for use before or after exercise, or it can be affixed to exercise equipment such as the Lifecycle Aerobic Trainer, a programmable hill pedaling device with an electronic display that shows such factors as pedaling speed, calorie expenditure rate and exercise time. In such an installation, the HRI heart monitor can be a separate unit or the circuitry can be added to the existing electronic system, with the heart sensors activated by hand contact with the handlebar grips.

* NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.